of University of Utah, Salt Lake City. Paratypes, nine nymphs same data, same deposition as holotype.

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LITERATURE CITED

ALLEN, R. K. 1967. New species of new world Leptohyphinae. Can. Entomol., 99: 350–375.

Notes on Larval and Adult Habits of *Vandykea tuberculata* Linsley

(Coleoptera : Cerambycidae)

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The tribe Methiini is represented by a relatively large number of species in North America (Linsley, 1962). Information of biology and habits is lacking for the vast majority of the group and plant associations are known for only a few species. Most species are nocturnal and are commonly attracted to light.

During the winter of 1964, cerambycid infested branches of the endemic *Cupressus Sargentii* Jepson from Butt's Canyon, Napa County, California were collected by the author. Several adult cerambycids were found in their pupal chambers when the branches were split. These beetles proved to be *Vandykea tuberculata* Linsley, a rarely encountered species which has one of the most limited distributional ranges of all the Cerambycidae of the Western United States. This peculiar species is known only from small portions of Napa and Lake Counties in Northern California (Linsley, 1961). The host, Sargent cypress, is confined to isolated areas of serpentine soil (Munz and Keck, 1959).

Further field observations were made at Mt. St. Helena as well as the Butt's Canyon area over a two year period. Many infested branches were brought in for laboratory observation. These were kept in glass aquaria with screen covers. Notes on larval and adult behavior were made both in the field and the laboratory. The larval feeding and manner of pupation were observed by splitting the wood longitudinally,

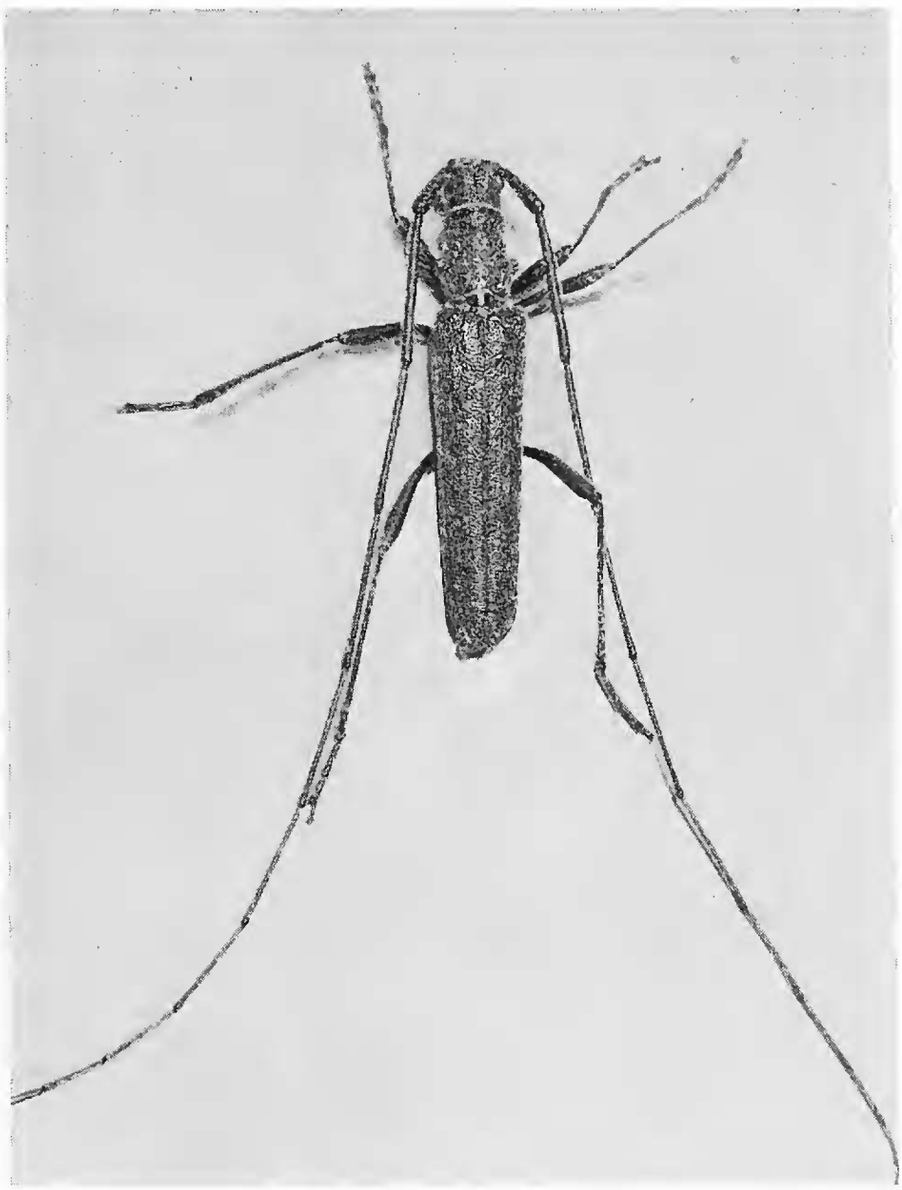
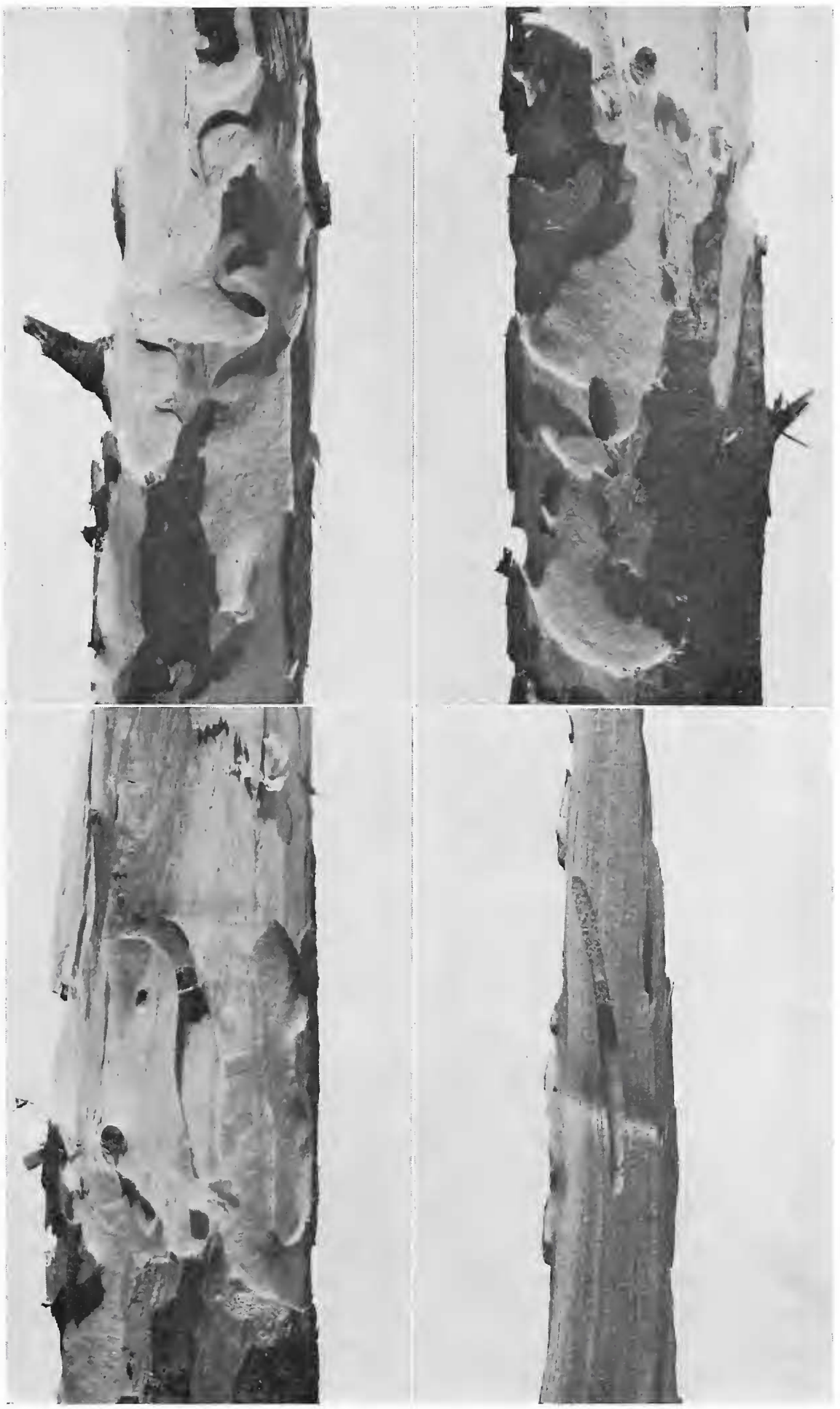


FIG. 1. Adult male of *Vandykea tuberculata* Linsley.

and mating and oviposition behavior were noted from freshly emerged adults.

ADULT BEHAVIOR

Mating.—Mating behavior was observed in the field, but, a more detailed study was made on adults confined in a small glass aquaria. Adults were kept in the presence of freshly cut branch sections of the host plant. In a resting position the male orients himself on a branch with his antennae pointed out and forward. In this manner the lengths of the antennae often encompass two-thirds or more of the branch circumference and can easily detect any females that may be present. Copulation was usually attempted by the males at the first physical contact with the females. As soon as contact was made the male began



to orient himself into the proper copulatory position. The front legs clasped the female between her prothoracic and mesothoracic pairs of legs. The male antennae were held up and directed obliquely backward while those of the female were held at right angles to the body. After the male had attained the proper position, the abdomen was strongly arched under and coupling was achieved. After coupling, the head and pronotum of the male underwent a series of jerky up and down motions. Each mating sequence began with 7 to 10 slow definite up and down movements followed by 10 to 12 rapid jerky movements. Several more joinings occurred, each terminating after 10 to 30 seconds of the violent male motions. A similar mating sequence was observed during a study of the habits of *Oeme costata abietis* Chemsak (Chemsak, 1965). There was occasional palpating of the female's pronotum by the male. This action apparently serves to pacify her since the process is repeated during copulation at signs of agitation or attempts to break away. Similar palpating occurs in numerous species of beetles including many cerambycids (Michelsen, 1963, 1966a and b).

Oviposition.—Although the host of this species has been known for some time evidence of *Vandykea* boring has been difficult to observe in the field. It is now known that the larvae feed only in branches and larger twigs that have recently died from lack of sunlight and are still attached to the living tree.

Oviposition was induced in the laboratory by placing adults together with freshly cut branch sections of the host. During the daylight hours the adults remained motionless on the underside of the branches. However, shortly after dark the beetles began both mating and oviposition behavior. The females, which had apparently been excited by the volatile odors of the wood, began seeking oviposition niches. The antennae were extended forward and slightly out over the surface and the extruded ovipositor was rapidly played over the bark. When a suitable niche was found, the ovipositor was inserted into it and the egg was laid after a series of pulsations of the abdomen.

Larval Habits

The larvae mine beneath the bark, deeply scoring the hard wood and finely reticulating the surface (fig. 1). A fine light colored granular

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Fig. 2. Upper left: Larval scoring of surface of sapwood of *Cupressus Sargentii*. Upper right: Larval scoring of sapwood and adult emergence hole. Lower left: Pupal chamber showing hard frass plug. Lower right: Pupal chamber showing extreme length and frass plug.

frass mixed with dark pieces of bark and feces gives a speckeled appearance to the frass which is loosely packed into irregular galleries. Large quantities of frass are expelled through small openings cut through the bark. By this means a large portion of the gallery about the feeding larva is kept free of any frass. The galleries may be quite extensive often reaching a length of two feet or more. This work bears a striking resemblance to that of *Oeme costata* (Chemsak, 1965). Although the galleries of separate larvae never intersect, they either diverge or one larvae tunnels beneath the gallery of another and again returns to the normal feeding area beneath the bark. After completion of feeding, the larvae bore into the heartwood and begin construction of pupal chambers.

The larvae enter the heartwood at a right angle to the grain. After boring to a sufficient depth a gradual turn is made and an elongate chamber is constructed parallel to the grain of the wood (fig. 1). The pupal chambers vary greatly in length measuring from 1½ to 3 inches long. A hard plug is placed at a constricted point approximately at the midpoint of the chamber (fig. 2). The plug is a hard pellet composed of dark fecal material apparently compacted when still moist. The inside edge of this plug is concave and light in color, and does not appear to be fecal material.

The time of pupation appears to be very dependent upon weather. Observations made during the winters of 1965 and 1966 show a significant variation in the time of pupation. During the winter of 1965 with its very mild rainfall, pupation occurred in October and early November. Transformation took place in early January. However, during the very wet winter of 1966–1967 pupation did not occur until late January and transformation took place in late March and April.

Adult emergence occurs through the fecal plug and out the elongate, flanged, emergence hole (fig. 2). The principle flight occurs in late April and May. A small number of individuals do not mature as rapidly and form a secondary flight in late June. The life cycle is always completed within one year.

Present knowledge does not indicate that *V. tuberculata* is attracted to ultra-violet light.

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Literature Cited

Chemsak, J. A. 1965. A new subspecies of *Oeme costata*, with observations on the habits of larvae and adults. J. Kans. Entomol. Soc., 38: 351–355.

LINSLEY, E. G. 1961. The Cerambycidae of North America. Part I. Univ. Calif. Publ. Entomol., 18: 1–135, 35 pl., figs. 1–16.

1962. The Cerambycidae of North America. Part III. Taxonomy and classification of the subfamily Cerambycinae, tribes Opsimini through Megaderini. Univ. Calif. Publ. Entomol., 20: 1–188, figs. 1–56.

MICHELSEN, A. 1963. Observations on the sexual behaviour of some longicorn beetles, subfamily Lepturinae. Behaviour, 22: 151–166.

1966a. On the evolution of tactile stimulatory actions in longhorned beetles. Z. Tierpsychol., 23(3): 257–266.

1966b. The sexual behaviour of some longhorned beetles. Entomol. Medd., 34: 329–355.

MUNZ, P. A., AND D. D. KECK. 1959. A California flora. Univ. Calif. Press, Berkeley and Los Angeles, 1–1681, figs. 1–134.

Two New Scorpions from Western North America

(Scorpionida : Vejovidae)

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Vejovis utahensis Williams, new species

(Figs. 1, 2)

DIAGNOSIS.—Moderate to large species of *Vejovis*, belonging to subgenus *Paruroctonus*. Body uniform straw yellow, pedipalps and walking legs somewhat lighter, pectines whitish; lacking stripes and other contrasting markings on dorsum. Pedipalp hands with palms swollen, strongly granular keels and short fingers. Metasoma with inferior lateral keels present and serrate; inferior median keels smooth to obsolete on segment I, smooth to crenulate on II and III, crenulate to serrate on IV. Pectines with 27 to 31 teeth in males, 17 to 21 teeth in females.

Vejovis utahensis appears related to *Vejovis mesaensis* (Stahnke), *Vejovis auratus* (Gertsch and Soleglad), and *Vejovis aquilonalis* Stahnke because of similarities in the following characteristics: short pedipalp fingers; terminal teeth of movable finger of chelicerae subequal on both borders; light yellow body coloration essentially lacking distinctive dark markings; basic pectinal structure similar. Differs from *V. mesaensis* in the following ways: ocular diad not ⅓ carapace width; bristles on inferior surface of metasoma not as numerous; pectinal teeth fewer; structure of inferior keels of metasoma not similar. Differs from *V. aquilonalis* and *V. auratus* in the following ways: inferior median keels of metasoma not all obsolete on segments I to IV; inferior lateral keels not weak and smooth on segments I to IV.

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